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Firm Turnover and Productivity Growth in the Canadian Retail Trade Sector

by John R. Baldwin and Wulong Gu

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Abstract

This paper examines firm turnover and productivity growth in the Canadian retail trade sector. Firm turnover occurs as the competitive process shifts market share from exiting firms and existing firms that contracted to entering firms and existing firms that expanded. There is considerably more firm turnover in the retail sector than in the manufacturing sector and more of it comes from entry and exit. Moreover, contrary to the manufacturing sector where only part of overall productivity growth comes from firm turnover and the re-allocation of resources from the less to the more productive, all of the aggregate productivity growth comes from this source in the retail sector. This suggests that the much-discussed Wal-Mart effect on retail sector productivity mainly comes from the Wal-Mart-created competitive pressure that shifts market share from exitors and declining incumbents to entrants and growing incumbents. Foreign-controlled firms contributed 30% of labour productivity growth and 45% of multifactor productivity growth in the retail trade sector in the period from 1984 to 1996, which are mainly due to the entry of foreign-controlled firms and expansion of more productive foreign-controlled existing firms.

Keywords: competition, firm turnover, productivity

Executive summary

A growing literature focuses on how firm turnover contributes to productivity growth. Competition leads some firms to grow and others to decline. Those that grow become more productive than those in decline. This process contributes to aggregate productivity growth as the more productive supplant the less productive. Much of the research in this area has focused on the manufacturing sector. In this paper, we examine firm turnover and aggregate productivity growth in the service sector. In particular, we will focus on the retail trade sector in Canada.

The paper focuses on six questions:

First: How much turnover is there in the retail sector?

Answer: The Canadian retail trade sector has high firm turnover. About 60% of firms that were present in 1984 were no longer in operation in 1998. The exiting firms accounted for 25% of total sales and 30% of total employment of the retail trade sector. About 70% of firms that were in operation in 1998 were new firms that had entered the retail sector during the 1984-to-1998 period, accounting for 42% of total sales and 41% of total employment.

In addition to firm turnover through entry and exit, firm turnover can also occur through gains and losses in market share in existing firms. During the 1984-to-1996 period, about 50% of market share was transferred from firms that either contracted or closed to new firms or firms that expanded. The continuing firms that increased market share acquired an additional 11 percentage points in market share over the period. The entering firms captured 36 percentage points. The continuing firms that lost market share lost a total of 22 percentage points over the period, while exiting firms relinquished 25 percentage points.

Second: What is the profile of entrants to the industry?

Answer: Entering firms are much more productive than exiting firms. On average, the firms that entered the retail sector in the 1986-to-1998 period had labour productivity and multifactor productivity that were about 20% higher than the firms that exited in that period. Together, these results suggest that entrants had an advantage over exits with regard to both labour and multifactor productivity. Entrants at birth have similar labour productivity and higher multifactor productivity in comparison with incumbents, but are much smaller than incumbents.

Third: Does the ongoing reallocation make a positive and significant contribution to aggregate productivity growth?

Answer: The overall productivity growth in the retail sector can be decomposed into a within-firm effect and the effect of firm turnover. The within-firm effect measures the contribution to overall productivity growth of growth within the surviving firms, holding their shares of inputs or outputs constant. The effect of firm turnover and ongoing re-allocation on aggregate productivity consists of the between-effect that represents the effect of the re-allocation of output and inputs among surviving firms and the effect of firm entry and exit.

Growth in labour and multifactor productivity in the Canadian retail trade sector is entirely accounted for by firm turnover and restructuring in the retail trade sector over the period from 1984 to 1998. Entry and exit accounted for 70% of labour productivity growth in the retail trade sector. Restructuring and firm turnover among surviving firms accounted for 35% of overall productivity growth. The within-effect is small and slightly negative, as there was little productivity growth at an average retailing firm. The results for the Canadian retail trade sector stand in sharp contrast to the results for the Canadian manufacturing sector, where entry and exit and firm turnover account for about 50% of labour productivity growth in a 10-year period.

The results for the retail sector suggest that the well-documented productivity gains from the increased use of information and communication technologies (ICTs) in the retail sector comes from the effect of firm turnover, as entering firms and existing firms that use ICTs and adopt innovative organizational practices gain market share from exiting firms and less productive existing firms. The results also suggest that the much-discussed Wal-Mart effect on retail sector productivity mainly comes from the Wal-Mart-created competitive pressure and restructuring that shifts market share from exitors and incumbents that lost market share to entrants and incumbents that gained market share.

Fourth: What is the contribution of foreign-controlled firms to aggregate productivity growth?

Answer: Foreign-controlled firms contributed 5.7 percentage points or 30% of labour productivity growth in the retail trade sector for the period from 1984 to 1998. They contributed 4.7 percentage points or 45% of multifactor productivity growth in the same sector. The contribution of foreign-controlled firms to productivity growth is disproportionately larger than their contribution to sales, which was about 20% over the period, and is mainly due to the entry of foreign-controlled firms and the expansion of more productive foreign-controlled existing firms.

Fifth: What is the nature of the selection process that entrants undergo after birth? Do they start life with the same productivity level as incumbents or do they start well behind and then experience a catch up? Is the selection process one that culls the smallest and least productive?

Answer: Entrants undergo a selection process after birth. Of an entering cohort, the least productive firms exit and the more productive ones survive. The surviving firms of the entering cohort exhibit declining failure rates as they learn about best business practices. About one quarter of the entrants exit during the first three years after birth, and about one half of the entrants survive until the eighth year. The surviving firms of an entering cohort reach the size of incumbents in the ninth year. Successful entrants have rapid output growth after the fifth year and have rapid labour productivity growth after the seventh year. During earlier years of their life, entrants show little significant change in output and labour productivity.

Sixth: What is the type of learning process that takes place after birth?

Answer: Learning takes place among large entrants. For the average entrant, labour productivity growth and multifactor productivity growth are negative after birth. The growth in output, capital and labour is also lower than the incumbent population. The average entrant would reach a peak

in output in about its ninth year and would not catch up to the size of incumbents. Unlike the average entrant that would not catch up to the size of incumbents, the entering cohort of larger entrants reaches the size of incumbents in its ninth year. The output of the entering cohort that survived until the ninth year is about 2.2 times as large as the output at birth, which is slightly bigger than the output difference between the entrants at birth and the incumbents.

The evidence then, in this paper, suggests that the retailing sector differs from the manufacturing sector with respect to both firm turnover and the dynamics of productivity growth. Entry is far more important in absolute size. At any point in time, a larger percentage of firms are recent entrants and more will shortly become exits. Entry and exit contributes more to aggregate productivity growth in the retail sector than in manufacturing. Entrants experience a very different life cycle. They do not start with as large a productivity disadvantage early in life as they do in manufacturing, nor do they experience a slow catch up in their productivity growth as does the manufacturing sector. Entrants start off with a productivity of about the level of incumbents. They tend to decline in relative productivity after birth. The process that leads to changes in firm size differs substantially for the smaller and larger entrants: the former do not catch up to incumbents, while the latter do. Small and larger retail entrants follow very different paths.

1 Introduction

A large number of recent empirical studies have examined the contribution of industrial competition and ongoing reallocation of outputs and inputs across individual firms to aggregate productivity growth (for review, see Baldwin and Gorecki 1991; Baldwin 1995; Disney, Haskel and Heden 2003; Foster, Haltiwanger and Krizan 2001).

Three main findings have emerged from these studies. First, there is a large amount of ongoing reallocation of outputs and inputs. Firm turnover takes place as resources and market shares are transferred from one set of incumbent firms (those in decline) to another set (growers) and from exiting firms to entering firms. Second, the ongoing reallocation makes a positive and significant contribution to aggregate productivity growth. Third, new firms often undergo both selection and learning process. The least productive entrants exit and tend to have a short life, while the more productive ones survive and improve productivity performance over time. Over a period of time, the process of firm entry and exit plays an important role in aggregate productivity growth.

While we have learned much from this growing literature, much of the research has focused on the manufacturing sector, which has been the main source of aggregate productivity growth. However, since the early 1990s, the services-producing industries have emerged as the dominant source of aggregate productivity growth in Canada, the United States and other developed countries (Triplett and Bosworth 2004).[1] Pakes and Erikson (1998) first suggested that the entry process should be very different in retailing and manufacturing. To better understand how this translates into differential sources of productivity growth, a number of papers have begun to extend the study of the dynamics of aggregate productivity growth from beyond manufacturing into the service sector (Foster, Haltiwanger and Krizan 2006 for the U.S. retail trade sector; Haskel and Khawaja 2003 for the U.K. retail trade sector). This paper contributes to the literature by examining firm turnover and the dynamics of productivity growth in the Canadian retail trade sector.

The retail trade sector in Canada accounted for 15% of hours worked and 8% of value-added in the Canadian business sector in the 1990s. It experienced rapid productivity growth during the past decade. From 1990 to 2003, labour productivity in the retailing sector rose by 2.8% per year. This is well above the 1.9% growth in the Canadian business sector (Table 1).[2] During the 1990-to-2003 period, the retail trade sector contributed 0.64 percentage points or 22% of the overall labour productivity growth in the business sector.[3] It is thus critical to examine the retailing sector in order to understand the productivity growth dynamics of the Canadian business sector (Wölfl 2003).

1. The service sector has long been characterised as a stagnant sector with little productivity growth and slow technological progress.
2. Rapid productivity growth has also occurred in the U.S. retailing sector. In the United States, labour productivity increased by 3.4% per year in the retail trade sector over the period 1987 to 2003 while it rose by 2.4% per year in the business sector.
3. In addition, there was rapid total multifactor productivity growth in the retail trade sector. According to Statistics Canada, multifactor productivity in the retail trade sector increased by 1.7% per year during the period 1990 to 2000 while it rose by 0.8% in the business sector.

A number of substantial changes have occurred in the Canadian retailing sector in the past decade. First, competition became more intense as big-box stores from the United States, such as Wal-Mart, entered the Canadian retailing sector. The McKinsey Global Institute (2001) finds that much of productivity growth in general merchandise retailing can be attributed to the influence of one company, Wal-Mart.[4] The increased competition from Wal-Mart is seen to have driven smaller, local stores out of business and forced other retailers to adopt its technological and managerial best practices (so-called Wal-Mart effect).

Table 1
Annual labour productivity growth in the retail trade sector, 1990 to 2003

Sector	United States	Canada
	percent	
Retail trade	3.36	2.82
Total business	2.42	1.87
	percentage points	
Contribution of the retail trade to the business sector productivity growth	0.65	0.41

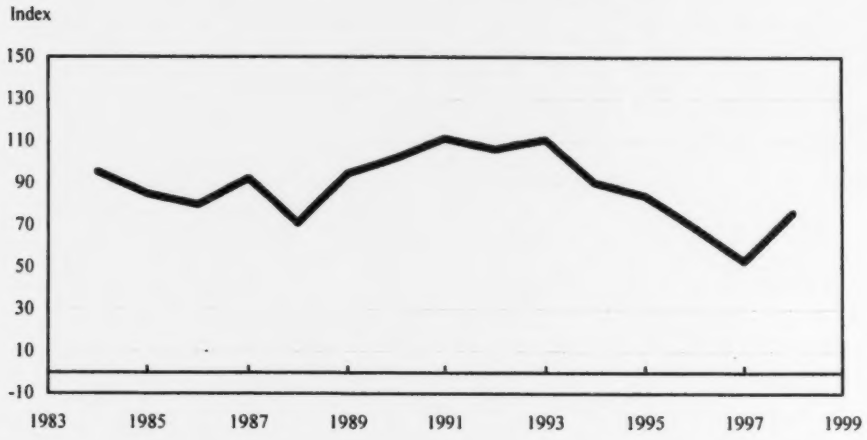
Note: The contribution of the retail trade sector to aggregate productivity growth is calculated as the productivity growth of the retail trade times its share in the hours worked of the business sector.
Sources: Statistics Canada; U.S. Bureau of Labor Statistics.

Second, the retailing sector has invested heavily in information and communication technologies (ICT). Over 30% of capital services in the retailing sector come from ICT capital services (Gu and Wang 2003). There is widespread adoption of electronic tracking and electronic scanning among retailers (Doms, Jarmin and Klimek 2004). ICTs and computerization have allowed retail stores to reduce the cost of inventories. The results on the dynamics of productivity growth presented in this paper add to our understanding of the importance of the Wal-Mart effect and how information and communication technologies have contributed to productivity in the retail trade sector.

Third, the retail trade sector became less concentrated during the 1990s as competition became more intense (Chart 1). For the 1990-to-1997 period, the Herfindahl concentration index declined from 102 to 53 in the sector.[5]

4. Under the standard industrial classification (SIC), general merchandise retailing is one of 18 SIC 3-digit retailing industries that constitute the retail trade sector.
5. Foster, Haltiwanger and Krizan (2002) find that the retail trade sector in the United States became more concentrated over the period, with the four-firm concentration ratio increasing from 5.2% in 1987 to 6.8% in 1992 and increasing further in 1997.

Chart 1
Herfindahl concentration index in the retail trade sector



Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

Two recent studies have examined the relationship between firm turnover and productivity growth in the service sector, one in the U.S. retail trade sector and the other in the U.K. retail trade sector. Foster, Haltiwanger and Krizan (2006) find that labour productivity growth in U.S. retailing was due to more productive new stores displacing much less productive exiting stores rather than productivity growth in incumbent stores over the 1990s. This suggests that firm turnover, through entry and exit, is much more important for overall productivity growth in the retail trade sector than in the manufacturing sector in the United States. In the U.S. manufacturing sector, about 30% of productivity growth over a 10-year period was accounted for by more productive plants displacing less productive exiting plants.[6]

Haskel and Khawaja (2003) have examined productivity growth dynamics in the U.K. retailing sector over the period from 1997 to 2001. They conclude that the entry and exit of retailing stores provided an important source of productivity growth in the U.K. retail trade sector, accounting for about 50% of overall productivity growth.

The rest of this paper is organized as follows. In Section 2, we describe the data and measures of labour productivity and multifactor productivity. In Section 3, we present empirical evidence on firm turnover in the retailing sector. Section 4 measures the contribution of firm turnover to aggregate productivity growth in the retail trade sector. In Section 5, we examine the role of selection and learning among new retail stores. We provide concluding remarks in Section 6.

6. The contribution of plant entry and plant exit to productivity growth in the Canadian manufacturing sector is about 20% over a 10-year period (Baldwin and Gu 2006).

2 Data

For the analysis of this paper, we use Statistics Canada's T2-LEAP longitudinal firm-level database. This is an experimental database that was derived from linking two administrative databases. The first database—the Longitudinal Employment Analysis Program (LEAP) file—is a database that includes all employers in Canada, both incorporated and unincorporated, that register a payroll deduction account with Canada Revenue Agency. While the file was not originally constructed to maintain longitudinal integrity for entry-and-exit studies, longitudinal tracking of workers has been used to permit a usable file for longitudinal purposes. This file contains a longitudinal firm identification number that will be used to examine the amount of entry and exit on the file.[7] A derived measure of average employment, called average labour units (ALU), is estimated by the LEAP program and added to the file. The ALU for a firm is calculated as the ratio of the total payroll of the firm to average annual wages of the workers in that firm's industry, size class and province.[8] The companies in the LEAP file have been assigned to 3-digit 1980 Standard Industrial Classification (SIC) industries using information from the Business Register.

For research purposes, the LEAP file has been linked to the Corporate Tax Statistical Universal File (T2SUF) that includes all incorporated firms that file a T2 tax return with Canada Revenue Agency. The T2 file provides data on sales, gross profits, equity and assets for all incorporated firms in Canada.[9]

The LEAP and T2SUF files do not have a common company identifier; a method was therefore developed to match the entities in the two files so as to create a linked T2-LEAP longitudinal database that gives measures of output (revenue), capital (assets) and labour (ALU). Since only corporate tax returns are used, the resulting linked file covers all incorporated firms in Canada. In some cases, supplementary files that contain both the T2 corporation number and the LEAP payroll deduction account number can be used to link the T2 and LEAP files. In other cases, the name and address of companies have been used to link the two files. The resulting units are synthetic entities, in that they link legal entity tax data to payroll data that comes from related though not identical units. The value of the file lies not in profiling specific units but in providing broad tendencies in populations.

Employment data in the LEAP file are reported on a calendar-year basis. On the T2 files, the year of attribution is set as the year of the end of a fiscal period. For the T2-LEAP file, Statistics Canada has converted the value of financial variables in the T2 file to calendar-year terms.

To calculate the ALU, the LEAP attributes the payroll of a firm to a calendar year. This will underestimate the ALU for the firm that operates for a partial year in the birth year.[10] This will

7. For more on the construction of this database, see Baldwin, Dupuy and Penner (1992).
8. The average wages of workers are derived from Statistics Canada's Survey of Employment, Payrolls and Hours.
9. Unincorporated businesses do not file a T2 form and are, thus, excluded from our data. The unincorporated business accounts for about 10% of total hours worked in the retail sector in 1997.
10. The average labour units of new firms in the data increase by about 60% from the birth year to the first full operating year. This high growth is due to partial reports in the birth year.

lead to an overestimation of growth in ALU for a firm in the birth year.[11] To account for the partial-year reporting, we define an entrant as a firm that does not exist in year t-2 and exists in both year t-1 and t. That is, a firm has to be in the T2-LEAP file for two consecutive years to be counted as an entrant.

The data show large fluctuations over time for three SIC 3-digit retail trade industries: liquor, wine and beer stores; prescription drugs and patent medicine stores; and men's clothing stores. We have removed these three industries from our data. We have also removed from our data those firms that have no employment or no sales. The final data for the analysis consists of the incorporated firms in 16 SIC 3-digit industries of the retail trade sector.

In the empirical analysis, we will examine both labour productivity and multifactor productivity. Labour productivity is defined as real value-added per worker. The value added for the retail trade sector is the sum of gross margins and value added from activities such as commission revenues, rental and leasing incomes, and labour revenue from repair and maintenance. Labour productivity is a partial measure. The growth in labour productivity may come from substitution of capital for labour or improvement in overall production efficiency. Multifactor productivity provides a measure of the overall production efficiency and is calculated as real value added per unit of combined capital and labour. Multifactor productivity is calculated as:

$$\ln TFP_{it} = \ln Y_{it} - \alpha_K \ln K_{it} - \alpha_L \ln L_{it} \qquad (1)$$

where Y is real value-added, K real capital, L average labour units, the α's are shares of each capital in output, i denotes retail store, and t denotes year. Capital stock is measured as the value of assets, deflated using the output price index of the retail trade sector.[12] The factor shares are calculated at the retail trade sector level. The data at the industry level show the income share of capital is about 20% in the retail trade sector and the income share of labour is about 80%. The shares have shown little changes over the past two decades. We will use these shares of capital and labour in calculating multifactor productivity of each retail store. Foster, Haltiwanger and Krizan (2006) and Disney, Haskel and Heden (2003) used a similar approach to construct multifactor productivity of individual firms.

The value-added output in the retail trade sector is primarily trade margins. The nominal trade margins need to be deflated to derive a real measure of trade margins that can be used to measure output growth and productivity growth in this sector. As price deflators for trade margins are not available, assumptions are often made about the relationship between the changes in the services provided by the retail sector and changes in nominal trade margins in order to estimate real trade margins.

The U.S. Bureau of Economic Analysis assumes that the change in the nominal margin rate over time is entirely due to changes in margin prices with no contribution from changes in the real services per unit of real sales provided by retail stores. This assumption implies that the rate of

11. For more discussion, see Baldwin, Beckstead and Girard (2002).
12. The output price index is similar to the price index of capital stock in the retail trade sector that is derived from Statistics Canada's Productivity Accounts database. The results in this paper do not change when we use the price index of capital stock to deflate the value of assets.

change in retail services is the same as the rate of change in retail sales in constant dollars (Triplett and Bosworth 2004). As the rate of change in real trade margins provides a measure of retail services, the rate of change in real trade margins will be the same as the rate of change in real sales using this assumption. In this paper, we will adopt this assumption. Essentially, we can replace the real value-added measure by real sales for the purpose of calculating labour productivity and multifactor productivity in the retail sector.

In 1984, there were about 60,000 incorporated retail firms in the T2-LEAP file. The number of firms increased over time. In 1998, there were about 80,000 incorporated firms in the sector. Table 2 presents summary statistics of changes in output, inputs, labour productivity and multifactor productivity in the total retail sector, as calculated from the data in the T2-LEAP file. The first column shows annualized changes in the entire data over the 1984-to-1998 period. The next two columns cover different time periods.

Table 2
Summary statistics for the retail trade sector

	1984 to1998	1984 to 1990	1990 to 1998
	percent per year		
$\Delta \ln Y$	3.5	4.9	2.4
$\Delta \ln K$	3.9	5.0	3.1
$\Delta \ln L$	2.5	3.5	1.7
$\Delta \ln(Y/L)$	1.0	1.4	0.8
$\Delta \ln TFP$	0.7	1.1	0.5

Note: All numbers are average percentage growth.
Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

We have compared the productivity growth estimates for the retail trade sector from the T2-LEAP file to those published by Statistics Canada that use other sources of data that are deemed more ideal for the creation of the national accounts input–output tables. The latter cover both incorporated and unincorporated firms and they use a slightly different methodology for measuring labour inputs.[13] The T2-LEAP file shows that labour productivity increased by 1.0% per year in the retail trade sector over the period 1984 to 1998. Multifactor productivity rose by 0.7% per year. The industry productivity estimates of Statistics Canada indicate that labour productivity increased by 1.6% per year and multifactor productivity by 0.4% per year. The two measures of labour productivity growth are quite similar despite differences in coverage and methodology.

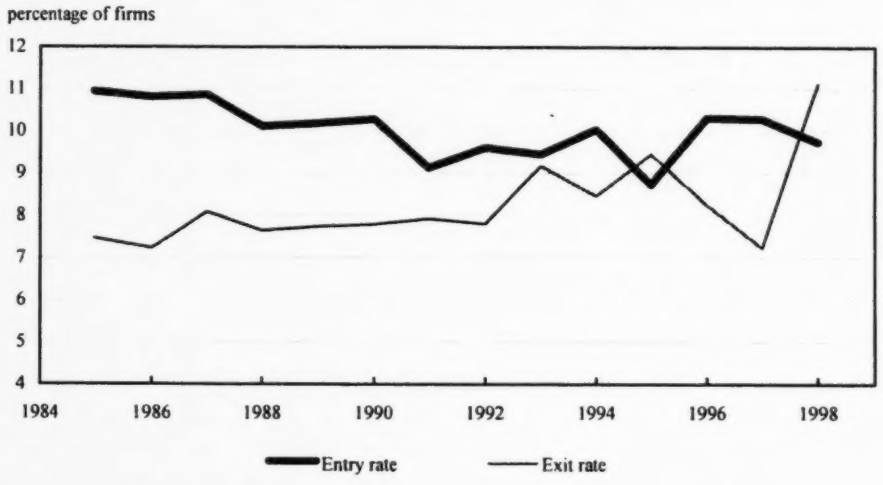
13. The official multifactor productivity measure has been adjusted for changes in capital and labour quality whereas the ones that are used here are not and therefore should be higher.

3 Firm turnover in the retail trade sector

Firm turnover occurs as the competitive process shifts market share toward firms that are more productive. It comes from the entry and exit of firms or gains and losses in market share in existing firms. In this section, we present the evidence on firm turnover in the retail trade sector.

Chart 2 contains the share of entering firms and exiting firms in total number of firms in the Canadian retail sector in a year. To avoid the problem of partial-year reporting during the birth year of new firms as discussed above, we define entrants in year *t* as firms that were absent in *t*-2, but appeared in *t*-1 and *t*. We define exits in year *t* as firms that were present in *t*-2 and *t*-1 but absent in *t*. Over the 1986-to-1998 period, entry rates were higher than exit rates. New firms accounted for about 10% of the number of firms in a year while about 8% of firms exited the retailing sector. Entry rates were counter-cyclical while exit rates were pro-cyclical, as entry rates declined during the recession of the early 1990s, while exit rates increased during the recession.

Chart 2
Firm entry and exit rates in the retail trade sector



Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

Table 3 contains annual averages over the 1986-to-1998 period of labour productivity, multifactor productivity and the size of entering, exiting and surviving (incumbents) firms for the total retail trade sector, with survivors normalized to 100. Entering firms have labour and multifactor productivity that are slightly higher than those of incumbents, but have higher labour and multifactor productivity than exiting firms. Exiting firms have lower labour productivity and lower multifactor productivity than surviving firms and entering firms. On average, the firms that entered the retailing sector in the 1986-to-1998 period had labour productivity and multifactor productivity that were about 20% higher than the firms that exited in the period. Together, these results suggest that entrants had an advantage over exits with regard to both labour and multifactor productivity.

Table 3
Labour productivity, multifactor productivity and size for entering, exiting and surviving firms

	Entering firms	Surviving firms	Exiting firms
Labour productivity	105.6	100.0	83.4
Multifactor productivity	105.4	100.0	86.6
Real output	65.1	100.0	39.3

Note: Data are annual average, 1986 to 1998, with survivors normalized to 100.
Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

These results suggest that firm turnover through entry and exit should be an important source of the overall productivity of the retail trade sector. Entrants have higher labour productivity and higher multifactor productivity than the firms that they supplant. According to the decomposition that we present in the next section, entry and exit will raise overall productivity so long as entering firms are more productive than the firms that they replace.

While entrants have labour and multifactor productivity as large as those of incumbents, they are much smaller than incumbents (Table 3, row 3). The sales of entering firms are about 65% that of surviving firms. But entrants tend to have larger sales than exits, since the sales of exiting firms are only 40% that of surviving firms.

The average differentials between entrants, exits and survivors in Table 3 exist for most of the period, as shown in Chart 3, 4 and 5. New firms in the retail trade sector have higher labour productivity, higher multifactor productivity, and higher sales than exits in every year of the period. New entrants have labour and multifactor productivity as large as that of incumbents, but are much smaller for most of the period.[14]

In Table 4, we present the relative labour productivity, multifactor productivity and size of entrants, exitors and incumbents for foreign- and domestic-controlled firms. As the T2-LEAP file being used here provides information on the country of control only for the period from 1984 to 1996, we will focus on that period. We find that the average differences in productivity and size between entrants, exitors and continuers exist for both foreign- and domestic-controlled segments of the retail sector. For example, foreign-controlled entrants are more productive than foreign-controlled exitors, and have productivity similar to that of foreign-controlled incumbents. Foreign-controlled firms that exit are less productive than foreign-controlled surviving firms.

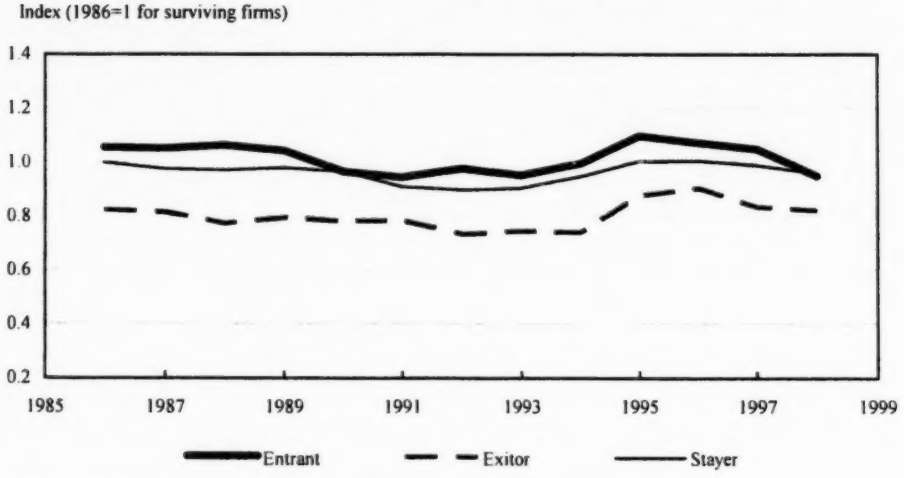
The results in Table 4 also show that foreign-controlled entrants tend to have higher labour and multifactor productivity and are much bigger than domestic-controlled entrants. Similar

14. The finding that small entrants have similar productivity vis-à-vis large incumbent firms suggests that there is no positive link between productivity and size in the retail trade sector as there is in the manufacturing sector. That is indeed the case. We find that labour productivity is negatively linked to employment across retailing firms in 1984 with t-statistics of 1.85. Multifactor productivity is negatively related to employment with t-statistics of 2.89.

differences in productivity and size exist between foreign- and domestic-controlled exitors, and between foreign- and domestic-controlled continuing firms.

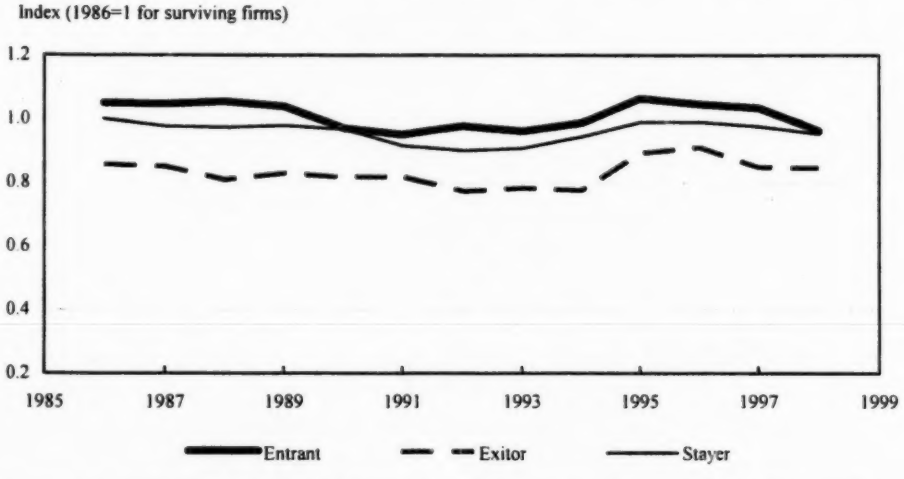
The entry and exit rates in Chart 2 are calculated on an annual basis. Long-run turnover rates will differ from short-run turnover rates if not all entrants survive. If all entrants survive, the long-run turnover rate will approximate the sum of the annual turnover rates. If all entrants last one year, long-run rates will approximate short-run rates.

Chart 3
Relative labour productivity by firm type in the retail trade sector



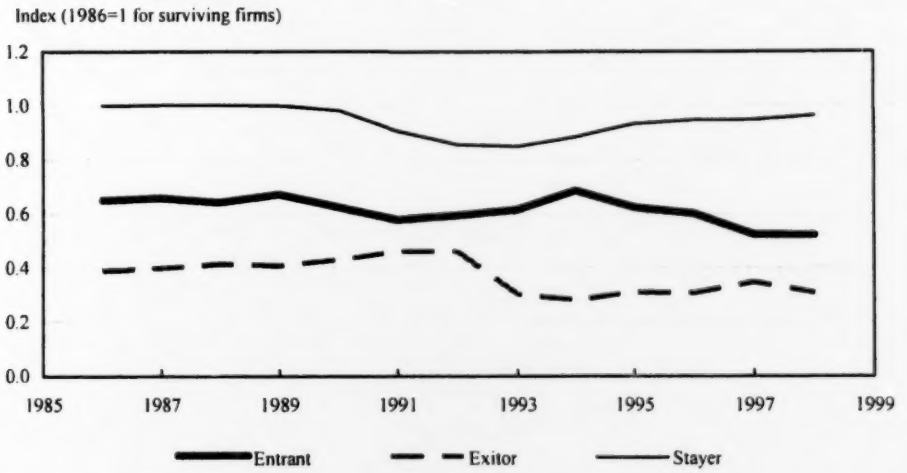
Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

Chart 4
Relative multifactor productivity by firm type in the retail trade sector



Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

Chart 5
Relative output by firm type



Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

Table 4
Labour productivity, multifactor productivity and size for entering, exiting and surviving firms by country of control

Country of control	Labour productivity	Multifactor productivity	Real output
Entering firms			
Domestic	106.2	105.8	67.2
Foreign	142.5	124.6	2041.6
Exiting firms			
Domestic	83.0	86.4	40.2
Foreign	122.5	108.9	1251.2
Surviving firms			
Domestic	100.0	100.0	100.0
Foreign	154.4	136.4	2261.7

Note: Data are annual average, 1986 to 1996, with domestic survivors normalized to 100.
Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

We calculate entry and exit rates over longer periods of 1984 to 1998, 1984 to 1990 and 1990 to 1998 (Table 5). Using this 14-year period, some 60% of firms that were present in 1984 were no longer in operation in 1998. These exiting firms account for 25% of total sales and 30% of total employment in the retail trade sector. About 70% of firms that were in operation in 1998 were new firms that had entered the retail trade sector during the period 1984 to 1998, accounting for 42% of total sales and 41% of total employment. We also calculate entry and exit rates by country of control over the period from 1984 to 1996. Foreign-controlled entrants in the period

accounted for 0.2% of the number of entrants and 19.7% of the sales from entrants. Foreign-controlled exitors accounted for 0.2% of the number of exitors and 4.1% of sales from exitors.

Our measure of entry and exit rates in the retail sector increases with the horizon over which firm turnover is measured. On an annual basis, the share of entrants in the total number of firms is 10% and the share of exits is 8% (Chart 2). When measured over a 14-year period of 1984 to 1998, the entry rate is about 70% and the exit rate is about 60%.

The estimated productivity differential between entrants and exits may also vary with the length of a period over which entrants and exits are defined. Entrants at birth are likely to have a lower average productivity than the entering firms that survive over a period of time, because of selection and learning effects. And the productivity of a cohort of surviving entrants may move up relative to the incumbent population (Baldwin and Rafiquzzaman 1995; Baldwin and Gu 2004, 2006).

Similarly, the base-year productivity of the firms that exit over a one-year period should be lower in comparison with those firms that exit over a longer period if the firms that last longer are the more productive.

When we define entrants and exits over a longer period, entrants still have higher labour productivity than exits. Using the results from Table 5, we estimate that entering firms have a 22% higher labour productivity than exiting firms during the period from 1984 to 1998, 17% higher during the 1984-to-1990 period, and 9% higher in the 1990-to-1998 period.

Table 5
Firm turnover in the retail sector, 1984 to 1998, 1984 to 1990 and 1990 to 1998

	Number of firms	Share of number of firms	Share of sales	Share of average labour units	Share of assets
		percent			
Period from 1984 to 1998					
Surviving firms	24,585	...	...	...	...
Entering firms	54,475	68.9	41.8	40.8	32.8
Exiting firms	35,364	59.0	25.1	30.1	21.6
Period from 1984 to 1990					
Surviving firms	40,188	...	...	...	...
Entering firms	32,241	44.5	22.1	19.5	20.0
Exiting firms	19,614	32.8	10.8	11.3	9.4
Period from 1990 to 1998					
Surviving firms	40,622	...	...	...	...
Entering firms	38,437	48.6	23.4	24.4	19.2
Exiting firms	31,953	44.0	19.4	22.0	20.0

... not applicable

Notes: Authors' calculation from T2-LEAP file. The share of entering and exiting firms in employment is calculated as the share over total employment of :hese firms plus continuing firms, whereas the employment of continuing firms is average value over the start and end years of a period. The share of sales and assets is calculated similarly.

Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

The above discussion has focused on firm turnover through entry and exits. Firm turnover can also occur through gains and loses in market share in existing firms. Table 6 presents the empirical evidence on shifts in market share from exitors and incumbents that lost market share to entrants and incumbents that gained market share. We divide firms into domestic-controlled and foreign-controlled firms. We will focus on the shifts in market share over the period from 1984 to 1996, for which the information on country of control is available in the T2-LEAP file.

During the 1984-to-1996 period, about 50% of market share was transferred from firms that either contracted or closed to new firms or firms that expanded. The continuing firms that increased market share acquired an additional 11 percentage points in market share over the period. The entering firms captured 36 percentage points. The continuing firms that lost market share lost a total of 22 percentage points over the period, while exiting firms relinquished 25 percentage points.

The gains in market share in entrants came from the losses experienced by exitors and incumbents. The replacement process in the retail trade sector can therefore be characterized by the entrants gaining market share from exiting firms and incumbents that contracted. This differs from the evidence for the manufacturing sector. The replacement process in the manufacturing sector was characterized by entrants displacing exitors and the expanding incumbents gaining market share from the incumbents that contracted.

The continuing firms as a group lost 11 percentage points in market share over the period from 1984 to 1996, this loss being mostly due to losses among domestic- controlled firms. Over that period, domestic-controlled firms lost 7 percentage points in market share. The foreign-controlled continuers that were acquired by domestic-controlled firms lost 3 percentage points in market share. The market share of the continuing firms that were foreign-controlled or acquired by foreign-controlled firms remained virtually unchanged.

Table 6
Shifts in market share in the retail trade sector, 1984 to 1996

	1984	1996	Change
	percent		
Surviving firms	74.9	64.2	-10.8
Domestic-controlled firms	54.5	47.5	-6.9
Domestic-controlled firms acquired by foreign firms	0.2	0.7	0.6
Foreign-controlled firms	11.4	9.8	-1.6
Foreign-controlled firms acquired by domestic firms	8.9	6.1	-2.7
Market-share gaining continuers	21.1	32.5	11.4
Market-share losing continuers	53.8	31.6	-22.2
Entering firms	...	35.8	35.8
Domestic-controlled firms	...	28.8	28.8
Foreign-controlled firms	...	7.1	7.1
Exiting firms	25.1	...	-25.1
Domestic-controlled firms	24.1	...	-24.1
Foreign-controlled firms	1.0	...	-1.0

... not applicable
Note: Authors' calculation from T2-LEAP file.
Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

Our results for the retailing sector, and those from previous studies for the manufacturing sector, show a number of differences in firm turnover between the two sectors (see Baldwin and Gu 2003; Baldwin, Beckstead and Girard 2002 for evidence on firm turnover in the manufacturing sector). First, entry and exit rates and market share shifts are higher in the retail trade sector than in the manufacturing sector. Baldwin, Beckstead and Girard (2002) find that about 8% of all plants are new in the manufacturing sector over the 1989-to-1997 period when calculated on an annual basis. In comparison, we find about 10% of all firms are new in the retail sector on an annual basis over the period 1986 to 1998. When calculated over longer time periods, the differences are much larger. Baldwin and Gu (2006) report that from 1979 to 1999, the entry and exit rates were both 12% for the manufacturing sector. Despite being more than 6 years longer than the period used to measure entry and exit in retailing, the entry and exit rates in manufacturing are much lower than the 14-year period rates reported here for retailing.

Second, in comparison with continuing firms, entering firms are much more productive and much bigger in the retail trade sector than those in the manufacturing sector. The previous studies for the manufacturing sector show that the entrants tend to be less productive and much smaller than incumbents in their first year of existence. Of these new firms, the least productive exit while the firms that survive improve productivity. The process of selection and learning allows new firms to catch up to incumbents in the manufacturing sector (Baldwin and Rafiquzzaman 1995, Baldwin and Gu 2006).

In contrast, new retailing firms already have at birth labour and multifactor productivity that are similar to survivors or incumbents. Entrants in retailing are smaller than incumbents but their relative size is much larger than in manufacturing.

4 Contribution of firm turnover to productivity growth in the retail trade sector

In this section, we examine the contribution of firm turnover to productivity growth in the retail trade sector. We first present our methodology of decomposing productivity growth in the retailing sector into a within-firm effect and the effect of firm turnover. The within-firm effect measures the contribution to overall productivity growth of growth within the surviving firms, holding their shares of inputs or outputs constant. The effect of firm turnover on aggregate productivity consists of the between effect that represents the effect of the reallocation of output and inputs among surviving firms and the effect of firm entry and exit. For robustness, we use two methods of accounting for the effect of firm turnover on productivity growth, one proposed by Griliches and Regev (1995) and the other by Baldwin and Gu (2006). Baldwin and Gu (2006) examined the differences in the two decomposition methods and the underlying assumptions that alternate formulae employ.

The productivity of an industry can be calculated as a weighted sum of productivity of individual firms, using their shares of output or employment as weights:

$$P_t = \sum_i s_{it} p_{it} \tag{2}$$

where s_{it} is the share of firm i in total output or employment of an industry and P_t and p_{it} labour productivity or $\ln TFP$.[15] Griliches and Regev (1995) propose a decomposition of the change of aggregate productivity between $t-k$ and t that is written:

$$\Delta P_t = \sum_{i \in C} \bar{s}_i \Delta p_{it} + \sum_{i \in C} \Delta s_i \left(\bar{p}_i - \bar{P}\right) + \sum_{i \in N} s_{it} \left(p_{it} - \bar{P}\right) - \sum_{i \in X} s_{it-k} \left(p_{it-k} - \bar{P}\right), \tag{3}$$

where the bar indicates a time average over the base and end year, C denotes the set of continuing firms in the period, N the set of entering firms, and X the set of exiting firms. The first term measures the within-firm effect—the contribution to overall productivity growth of within-firm growth of surviving firms. The second term measures the between-firm effect that is often interpreted as the contribution from the reallocation of output and inputs across surviving firms. The third and fourth terms represent the contribution of entering and exiting firms, respectively. The last three terms, taken together, measure the contribution to aggregate productivity growth of firm turnover among incumbent firms and between entering and exiting firms.

In this decomposition, the contribution of entering and exiting firms to overall productivity growth is based on a comparison with an average firm in the period. The contribution to productivity growth of entering firms is positive if entering firms are more productive than the average firm. The contribution of exiting firms is positive if exiting firms are less productive than the average firm.[16]

Baldwin (1995) and Baldwin and Gu (2006) argue that the validity of a particular formula depends upon the validity of implicit assumptions contained in the counterfactual that underlies each formula. The Griliches-Regev formula implicitly assumes that an entrant replaces an average firm in the distribution; similarly, an exit is replaced by an average firm. However, if the ultimate effect of any group is to be assessed, knowledge of or assumptions about the replacement process are required. The calculated impact of entry, for example, will depend upon the productivity of the firm that it has replaced.

It may be more appropriate to use an alternate assumption. In the manufacturing sector, entrants are much smaller and much less productive than incumbents. But the firms that exit look very much like the entrants. Moreover, the share of entrants is about the same as the share of exits. Baldwin (1995) and Baldwin and Gu (2006) argue that small entrants compete with other small firms on the margins of the manufacturing sector with entrants replacing exits. The evidence also

15. We use employment shares in calculating aggregate labour productivity and output shares to calculate multifactor productivity.
16. Foster, Haltiwanger and Krizan (2001) compare entering and exiting firms to continuing firms in the base year.

shows that entering firms essentially displace exiting firms in the manufacturing sector.[17] In this case, it is more appropriate to compare entrants and exits in measuring the contribution of entry and exit to productivity growth. When this is done, Baldwin and Gu (2006) adopt the following decomposition for calculating the effect of entrants and continuing firms:

$$\Delta P_t = \sum_{i \in C} \overline{s}_i \Delta p_{it} + \sum_{i \in C} \Delta s_i \left(\overline{p}_i - P_X\right) + \sum_{i \in N} s_{it} \left(p_{it} - P_X\right) - \sum_{i \in X} s_{it-k} \left(p_{it-k} - P_X\right) \quad (4)$$

where P_X is the base-year productivity of exiting firms. By construction, the fourth term in the decomposition is equal to zero. The third term measures the contribution of entry and exit to overall productivity growth.

While the decomposition in Equation (4) accords with the replacement process for the manufacturing sector, the method is not consistent with the nature of the replacement process in the retail trade sector. As shown in Table 6, the share of entrants is much larger than just the share of exits in the retail trade sector—the entrants are also taking away market share from incumbents. For the retail trade sector, the replacement process is characterized by the entrants gaining market share from exiting firms and incumbents that contracted.

To accord with this replacement process, the decomposition in Equation (4) should be modified to:

$$\Delta P_t = \sum_{i \in C} \overline{s}_i \Delta p_{it} + \sum_{i \in C} \Delta s_i \left(\overline{p}_i - P_D\right) + \sum_{i \in N} s_{it} \left(p_{it} - P_D\right) - \sum_{i \in X} s_{it-k} \left(p_{it-k} - P_D\right) \quad (5)$$

where P_D is the base-year productivity of continuing firms that contracted over a period. The third and fourth terms together measure the contribution of entrants displacing exitors and declining incumbents to overall productivity growth. To show that is the case, we can rewrite Equation (5) by re-arranging the last two terms:

$$\Delta P_t = \sum_{i \in C} \overline{s}_i \Delta p_{it} + \sum_{i \in C} \Delta s_i \left(\overline{p}_i - P_D\right) + \sum_{i \in X} s_{it-k} \left(P_N - p_{it-k}\right) + \left(S_N - S_X\right)\left(P_N - P_D\right) \quad (6)$$

where P_N is the end-year productivity of entering firms, S_N is the share of entering firms at the end of the period, and S_X is the share of exiting firms at the start of the period. The third term in the equation is the productivity difference between entrants and exitors, multiplied by the share of exitors. It measures the contribution of the entrants displacing exitors to overall productivity growth. The fourth term in the equation is the productivity difference between entrants and declining incumbents, multiplied by the share of output and employment that entrants gained from the declining incumbents. It is interpreted as the contribution to overall productivity growth of entrants displacing the declining incumbents.

17. In reality, of course, some entrants take market share away from incumbents; but, on the whole, they replace exits. For more detail on the complexity of the replacement process, see Baldwin (1995).

If the share of entrants (S_N) equals the share of exitors (S_X), as is the case for the manufacturing sector, the decomposition (6) becomes the decomposition (4) that was used to examine the contribution of entry for productivity growth in the manufacturing sector in Baldwin and Gu (2006).

In the empirical section, we will make use of both decompositions, one by Griliches and Regev in Equation (3) and the other by Baldwin and Gu in Equation (6) and ask whether our answers vary much.

4.1 The results for the total retail trade sector

In applying our formulae, a decision has to be taken about whether to calculate the impact of turnover within each industry separately and then to aggregate the results, or to treat all 4-digit industries as belonging to one sector. In the former case, entrants are treated as affecting only firms—either exits or continuers—in their industry. In the latter case, we implicitly treat entrants in one sector as affecting firms—either exits or continuers—in other sectors.

It has been argued that competition in the retail trade sector takes place across most categories of the retail trade. Basker (2003) and McKinsey Global Institute (2001) conclude that the competitive pressure of Wal-Mart was felt throughout the retail trade sector. Wal-Mart and other big-box stores compete with retailers across many categories that include general merchandise stores, drug stores, apparel stores and grocery stores. Therefore, in the first instance, we carry out the decomposition of labour productivity and multifactor productivity at the level of the total retail trade sector.

The decompositions of labour productivity are reported Table 7 and of multifactor productivity in Table 8. Each cell in the table shows the percentage-point contribution to total growth from each component of the decomposition.

Table 7
Decomposition of labour productivity growth in the retail trade sector

	Within	Between	Net entry	Entry	Exit	Entry displacing exit	Entry displacing decliners
	percentage points						
1984 to 1998[1]							
Griliches and Regev	-0.8	6.3	12.1	2.2	10.0	...	...
Baldwin and Gu	-0.8	5.7	12.7	...	...	11.9	0.8
1984 to 1990[2]							
Griliches and Regev	-2.1	6.1	-0.5	-1.6	1.1	...	...
Baldwin and Gu	-2.1	5.8	-0.3	...	...	0.1	-0.3
1990 to 1998[3]							
Griliches and Regev	0.2	6.0	8.0	-0.5	8.5	...	...
Baldwin and Gu	0.2	6.0	8.0	...	...	8.0	0.0

... not applicable
1. Overall growth is 18 % in the period.
2. Overall growth is 3 % in the period.
3. Overall growth is 14 % in the period.
Notes: Authors' calculation from T2-LEAP file. The numbers are employment weighted and represent the percentage-point contribution to overall change.
Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

The message that is provided by both decomposition formulae is the same. Most labour productivity growth in the retail trade sector for the 1984-to-1998 period is accounted for by the entry and exit process. While the procedures use different assumptions, they yield the same result with regards to the joint effect of entry and exit. The results from both decompositions show that about 12 percentage points or about 70% of labour productivity growth is due to entry and exit. This is much larger than the size of entry and exit outlined in Table 5. Over the period, entry accounted for no more than 40% of employment.

The results from the decomposition by Baldwin and Gu show that most of the effect of entry on productivity in the 1984-to-1998 period is due to the effect of entrants displacing exitors, with a small positive contribution from the effect of entrants displacing the incumbents that contracted. This reflects the fact that entrants are much more productive than exitors while they have similar productivity in comparison with incumbents that declined.

The two terms that capture the impact of incumbent firms differ in sign. The between-firm contribution to productivity growth is positive for the 1984-to-1998 period. This captures the impact of shifting resources from declining incumbents to growing incumbents. The positive sign indicates that employment shifted from less productive firms to more productive continuing firms during the 1984-to-1998 period. This reallocation of employment across surviving firms accounts for about 6 percentage points or 35% of overall productivity growth in the retail trade sector.

The sum of contributions of net entry and between-firm effects adds up to slightly more than the total change in labour productivity because the within-firm effect is small and slightly negative.[18] The small within-firm effect indicates that there was little productivity growth in an average continuing firm of the retail trade sector during the period from 1984 to 1998. Productivity growth in the retail sector was entirely due to the effect of firm turnover that comes from entry and exit and market-share shifts in surviving firms.

The bottom panels of the table contain the decomposition results of labour productivity for two periods: 1984 to 1990 and 1990 to 1998. Firm turnover accounted for all of the productivity growth in both periods. But the relative importance of the between-firm effect and net entry effect in the overall contribution of firm turnover differs in the two periods. For the period from 1984 to 1990, the firm turnover effect comes from the reallocation of inputs and outputs among existing firms with little contribution from entry and exit. For the period from 1990 to 1998, it comes from both the re-allocation among the existing firms and the effect of firm entry and exit.

It is noteworthy that the within component is small in both periods, thereby indicating that the labour productivity of average continuing firms in the retail trade sector changed little for the two periods 1984 to 1990 and 1990 to 1998. Previous Canadian studies show that much of productivity growth in the retail trade sector is linked to the increased use of information and communications technologies (ICTs) and organizational innovation. Our decomposition results suggest that this ICT-led productivity growth comes from more productive entering firms and existing firms that use ICTs and adopt innovative organizational practices gaining market share from exiting firms and less productive existing firms. The results also suggest that the much-discussed Wal-Mart effect on retail sector productivity mainly comes from the Wal-Mart-created competitive pressure and restructuring that shifts market share from exitors and incumbents that lost market share to entrants and incumbents that gained market share.

Table 8 presents the decomposition results for multifactor productivity growth. Overall, the results for multifactor productivity growth are similar to those for labour productivity growth. Firm turnover coming from entry and exit and restructuring in existing firms accounts for virtually all of the multifactor productivity growth in the retail trade sector in the period from 1984 to 1998. The slightly negative within-firm effect indicates that surviving firms have a slight decline in multifactor productivity over the period. It should be noted that the net entry effect on multifactor productivity growth is negative in the 1990s, indicating that the firms that exited during the recession of the early 1990s had higher multifactor productivity than the firms that entered during the period. The difference between the labour productivity and the multifactor productivity results suggest that almost all of the gain in labour productivity in the latter period comes from increases in the capital intensity of entrants relative to the firms that they were replacing.

18. The finding in Foster, Haltiwanger and Krizan (2002) suggests that the within-firm effect from the Griliches-Regev decomposition (the sum of the within-effect plus half the covariance term in their decomposition) is also negative in the 1990s for the U.S. retail trade sector.

Table 8
Decomposition of multifactor productivity growth in the retail trade sector

	Within	Between	Net entry	Entry	Exit	Entry displacing exit	Entry displacing decliners
	percentage points						
1984 to 1998[1]							
Griliches and Regev	-3.5	11.2	5.4	4.3	1.1	...	...
Baldwin and Gu	-3.5	10.0	6.5	...	...	4.3	2.1
1984 to 1990[2]							
Griliches and Regev	-4.5	5.5	16.2	16.5	-0.2	...	...
Baldwin and Gu	-4.5	4.2	17.5	...	...	9.3	8.2
1990 to 1998[3]							
Griliches and Regev	-1.1	8.7	-11.8	-0.5	-11.3	...	...
Baldwin and Gu	-1.1	8.7	-11.8	...	...	-11.8	0.0

... not applicable

1. Overall growth is 13 % in the period.
2. Overall growth is 17 % in the period.
3. Overall growth is -3 % in the period.

Notes: Authors' calculation from T2-LEAP file. The numbers are output weighted and represent percentage-point contribution to total change.

Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

These results stand in a sharp contrast to the results for the Canadian manufacturing sector produced by our previous studies. In the manufacturing sector, firm turnover from entry and exit and restructuring in existing firms accounts for about one half of overall labour productivity growth in a 10-year period (Baldwin and Gu 2004). In contrast, firm turnover in the retail trade sector accounts for all of labour productivity and multifactor productivity growth in a 10-year period. Our findings on the importance of firm turnover in the retail trade sector relative to the manufacturing sector are consistent with the U.S. findings of Foster, Haltiwanger and Krizan (2006). They report that entry and exit accounts for all of the labour productivity in the U.S. retail trade sector over the 1990s. In the U.S. manufacturing sector, about 30% of labour productivity growth and multifactor productivity is due to entry and exit over a 10-year period.

Table 9
Decomposition of labour and multifactor productivity growth by country of control in the retail trade sector

	Within	Between	Entry and exit	Sum
	percentage points			
Labour productivity growth				
Domestic-controlled firms	-2.8	4.0	10.3	11.4
Foreign-controlled firms	1.3	1.5	3.0	5.7
All firms	-1.5	5.4	13.2	17.1
Multifactor factor productivity growth				
Domestic-controlled firms	-4.7	6.5	3.7	5.6
Foreign-controlled firms	0.1	1.6	3.0	4.7
All firms	-4.6	8.1	6.8	10.2

Notes: Authors' calculation from T2-LEAP file. The results are based on the decomposition method by Baldwin and Gu. The numbers are output weighted and represent percentage-point contribution to total change.

Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

In Table 9, we present the evidence on the contribution of foreign-controlled firms and domestic-controlled firms to productivity growth in the retail sector. The results are based on the decomposition method in Equation (6) presented in this paper. The results based on the method by Griliches and Regev are similar. We will focus on the period from 1984 to 1996, for which information on the control of ownership is available in the T2-LEAP file. For the period from 1984 to 1996, foreign-controlled firms contributed 5.7 percentage points or 30% of labour productivity growth in the retail trade sector. They contributed 4.7 percentage points or 45% of multifactor productivity growth in the retail trade sector. The contribution of foreign-controlled firms to productivity growth is disproportionately larger than their contribution to sales. Foreign-controlled firms accounted for about 20% of total sales over that period.

The contribution of foreign-controlled firms to labour productivity and multifactor productivity growth mainly comes from the entry of foreign-controlled firms and restructuring in existing foreign-controlled firms. The between-effect among foreign-controlled firms is positive but small, indicating that, just as in the general population, there was little productivity growth in the average continuing foreign-controlled firm.

4.2 The results for individual retail trade industries

The results presented in the previous section represent the contribution of firm turnover to overall productivity growth in the aggregate retail trade sector. In this section, we examine the contribution of firm turnover in 16 industries of the Canadian retail trade sector, assuming that entrants replace firms within each industry rather than across industries. We have excluded from our analysis three retailing industries, due to measurement errors in those industries. These industries are liquor, wine and beer stores; prescription drugs and patent medicine stores; and men's clothing stores.

The decompositions for the growth in labour productivity over the period from 1984 to 1998 are presented in Table 10 and the results for multifactor productivity growth in Table 11. The results

are based on the decomposition method in Equation (6) presented in this paper. Overall, the results for individual industries are consistent with the results for the total retail trade sector. First, entry and exit make a positive contribution to labour productivity growth and multifactor productivity growth in 12 out of the 16 retail trade industries.

Second, restructuring and the reallocation of output and inputs across surviving firms leads to high labour productivity growth and high multifactor productivity growth in most industries. However, its contribution to labour productivity growth is smaller than that of entry and exit in most industries, but its contribution to multifactor productivity growth is larger than that of entry and exit in about half of the industries.

Third, firm turnover coming from entry and exit and restructuring in existing firms, accounts for most of the labour productivity and multifactor productivity growth in almost all retail trade industries.

Fourth, consistent with the results for the total retail trade sector, the within-firm effect is small and negative for most industries. Over the period from 1984 to 1998, labour productivity and multifactor productivity were virtually unchanged in the average existing firm of the retail trade sector.

Table 10
Decomposition of labour productivity growth at 3-digit Standard Industrial Classification retailing industries, 1984 to 1998

SIC[1]	Industry	Number of firms in 1998	Overall growth	Within	Between	Net entry
			percent per year	percentage-point contribution		
601	Food stores	14,582	-1.5	-1.0	0.1	-0.7
611	Shoe stores	852	-1.0	-1.5	0.3	0.2
613	Women's clothing stores	2,206	-2.3	-1.3	-0.6	-0.4
614	Clothing stores, n.e.c.[2]	2,069	3.6	0.9	1.1	1.6
615	Fabric and yarn stores	482	0.8	-0.1	0.4	0.5
621	Household furniture	2,268	-2.2	-2.1	0.2	-0.3
622	Appliances, T.V., radio and stereos	3,364	0.7	-0.4	0.5	0.6
623	Household furnishing	2,336	-1.5	-0.9	-0.2	-0.3
631	Automobile dealers	4,898	2.8	1.7	0.2	0.9
632	Recreational vehicle dealers	1,592	3.6	1.1	0.6	1.9
633	Gasoline service stations	5,833	-5.8	-3.9	0.1	-2.0
634	Automobile parts and accessories	2,629	0.9	-0.4	0.7	0.7
635	Motor vehicle repair shops	11,687	1.4	0.5	0.0	1.0
639	Other motor vehicle services	1,518	13.9	4.9	2.1	6.9
641	General merchandise stores	2,004	2.8	1.5	-0.3	1.6
690	Non-store retail	21,136	0.8	-0.3	0.6	0.5
	Simple average	...	1.1	-0.1	0.3	0.8

... not applicable

1. Standard Industrial Classification.

2. Not elsewhere classified.

Notes: Authors' calculation from T2-LEAP file. The results are based on the decomposition method by Baldwin and Gu. The weighted average across industries is calculated using average industry employment shares. The weighted sum of labour productivity growth across industries may differ from labour productivity growth in the total retailing sector. The difference can be attributed to the effect of employment shifts across industries.

Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

Table 11
Decomposition of multifactor productivity growth at 3-digit Standard Industrial Classification retailing industries, 1984 to 1998

SIC[1]	Industry	Overall growth	Within	Between	Net entry
		percent per year	percentage-point contribution		
601	Food stores	-0.8	-1.0	0.7	-0.4
611	Shoe stores	-0.4	-1.2	0.2	0.6
613	Women's clothing stores	-1.8	-1.1	-0.6	-0.2
614	Clothing stores, n.e.c.[2]	1.6	0.4	0.1	1.1
615	Fabric and yarn stores	0.4	-0.3	0.0	0.7
621	Household furniture	-0.8	-1.3	0.7	-0.2
622	Appliances, T.V., radio and stereos	-0.6	-0.7	0.4	-0.3
623	Household furnishing	-0.6	-0.8	0.0	0.2
631	Automobile dealers	2.4	1.1	0.1	1.2
632	Recreational vehicle dealers	2.1	0.4	0.2	1.4
633	Gasoline service stations	-2.5	-3.3	2.1	-1.3
634	Automobile parts and accessories	0.8	-0.6	0.7	0.7
635	Motor vehicle repair shops	0.7	0.0	0.2	0.5
639	Other motor vehicle services	-1.8	-0.6	0.2	-1.4
641	General merchandise stores	3.4	1.2	-0.7	2.9
690	Non-store retail	-1.1	-0.7	0.3	-0.8
	Weighted average	0.1	-0.5	0.3	0.3

1. Standard Industrial Classification.
2. Not elsewhere classified.

Notes: Authors' calculation from T2-LEAP file. The results are based on the decomposition method by Baldwin and Gu. The weighted average across industries is calculated using average industry output shares. The weighted sum of multifactor productivity growth across industries may differ from multifactor productivity growth in the total retailing sector. The difference can be attributed to the effect of output shifts across industries.

Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

5 Post-entry performance of new retail stores: Role of selection and learning

In this section, we examine post-entry survival and post-entry performance of new firms in the retail trade sector. The post-entry survival and performance is a main factor affecting the contribution of entrants to overall productivity growth over the life cycle of entrants.

Previous studies—mostly on manufacturing firms and plants—suggest that entrants undergo both selection and learning processes (Baldwin and Rafiquzzaman 1995, Baldwin and Gu 2006). The process of natural selection takes place as the least productive, new firms exit and more productive ones survive. Learning occurs as surviving entrants learn about best practices and how best to serve customers in the specific location and thus improve survival and performance. In manufacturing, entrants start relatively small and well behind incumbents, both in terms of

size and productivity. Via a selection and learning process, a cohort of surviving entrants gradually approaches the performance of incumbents. But the catch-up process is slow.

Our results show that retailing follows a very different process. Here, entrants start relatively large and they are often just as productive as existing firms. Here, a cohort does not have to catch up in terms of productivity; indeed, a cohort's productivity begins almost immediately to decline. Competition comes not so much from other incumbents, rather it comes from a constant stream of new firms that have discovered how to improve upon selling methods. Productivity begins to decline for entrants almost immediately after birth.

In this section, we investigate the growth profile of entry cohorts. We ask whether exit rates follow the same sort of duration dependence that has been found for manufacturing firms. Is the relative size a primary determinant of success in retailing as well as manufacturing, or does the fact that entrants start relatively larger matter? How rapidly does the size of surviving entrants increase? In particular, we ask when they approach the incumbent population in terms of size.

5.1 Post-entry survival

To examine post-entry survival of new firms in the Canadian retailing sector, we use the Cox partial likelihood proportional hazards model. Denote the hazard rate of firm i by λ_i, which is defined as the probability that the firm exits in interval t to $t+1$, conditional upon having survived until period t. We model the hazard rate of a firm as a function of firm labour productivity and multifactor productivity in log relative to average industry levels, firm size relative to average firm size, and a set of binary variables for Standard Industrial Classification (SIC) 3-digit industries and cohort:

$$\lambda_{it} = \lambda_o(t)\exp\left[\alpha_1 relprod_i + \alpha_2 relsize_i + \alpha_3 industry_i\right], \tag{7}$$

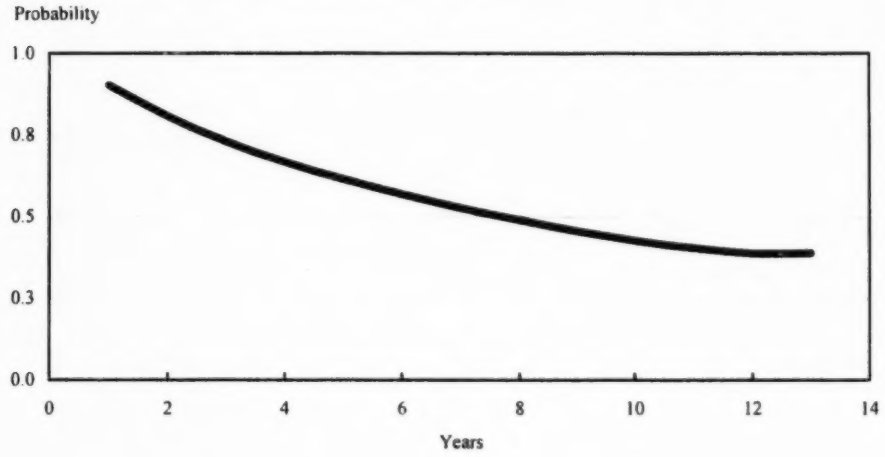
where $\lambda_o(t)$ is the baseline hazard, $relprod_i$ is initial labour productivity and multifactor productivity of firm i relative to the respective average industry levels, $relsize_i$ is initial employment in log form relative to average firm size of the respective industry, and the binary variables represent different cohorts and industries. As variables $relprod_i$ and $relsize_i$ are measured as deviations from means, the baseline hazard can be interpreted as the hazard for the mean firm.

We estimate this model on all cohorts of firms born from 1986 to 1996. To adjust for partial reporting of entrants during the birth year, we define entrants in t as firms that were absent in $t-2$ but were present in $t-1$ and t. We will also allow for censoring in the estimation as the lifetime of the entrants that survived until 1998 are right-censored.

Chart 6 plots the Kaplan-Meier survival curve for all retail stores born from 1986 to 1996. The survival curve shows the probability of still being present after a given duration. The exit rate of

new firms is high in the retail trade sector. A quarter of the entrants exit during the first three years after birth, and only half of the entrants survive until the eighth year.[19]

Chart 6
Survival of new firms in the retail trade sector



Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

The results that are derived from the Cox proportional hazards model (7) are presented in Table 12. The coefficients on relative labour productivity and multifactor productivity are negative and statistically significant at the 1% level. Entrants with high labour productivity and multifactor productivity are more likely to survive. Our estimates show that a 10 percentage-point increase in labour productivity at birth is associated with a 2.5 percentage-point increase in the survival rate. A 10 percentage-point increase in multifactor productivity is associated with a 2.4 percentage-point increase in firm survival. We also find that size at birth is related to firm survival. A 10 percentage-point increase in employment size is associated with a 3.5 percentage-point increase in the survival rate.

The coefficients on the binary variables for different entry cohorts indicate that the firms entering during the recession of the early 1990s (1990 to 1994) had higher exit hazard rates. The firms born during the expansion of 1995 and 1996 had the lowest exit hazard rates. The macro environment affects the rate of exit of new firms.

Chart 7 plots the baseline hazard from estimating the Cox proportional hazards model (7). It represents the hazard rate for exits for average entrants born in 1986 in the food stores industry.[20] The exit hazard rate decreases over time, except for the first year. During the first year, the hazard rate shows an increase. This suggests that the risk of failure increases in the first year. After the first year, the risk of failure becomes smaller, the longer a firm survives. The finding

19. This is higher than the survival rate reported for both unincorporated and incorporated retailers in Baldwin et al. (2000).
20. The omitted categories for industry and cohort binary variables are the food store industry and 1986 cohort.

that the hazard function for firm exit exhibits negative duration dependence is consistent with the finding in most previous studies (Baldwin 1995, Baldwin et al. 2000, Boeri and Cramer 1992, Mata and Portugal 1994, and McCloughan and Stone 1998). Negative duration dependence is often interpreted as evidence of learning: as new firms learn about best business practices, they are less likely to fail.

Table 12
Hazard rate analysis of firm exits in the Canadian retailing sector

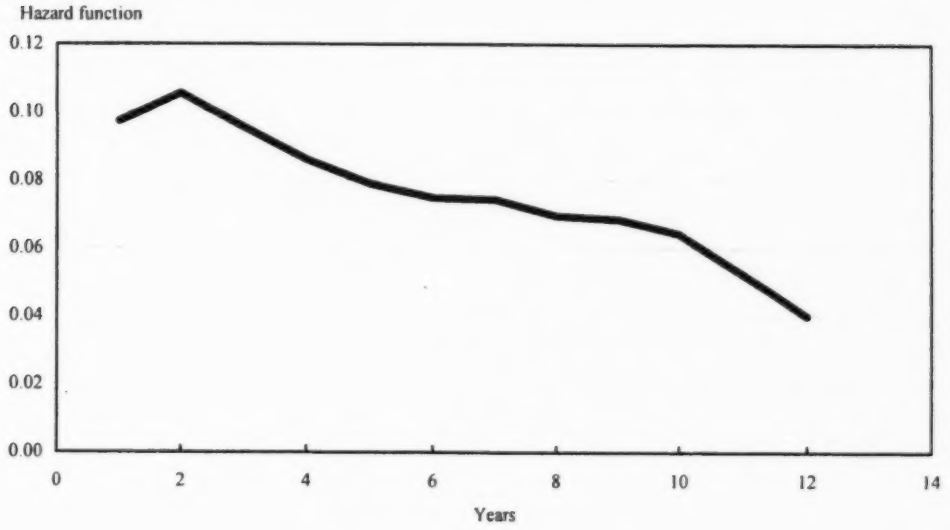
Variable	(1)	(2)
Employment in log	-0.387	-0.361
	(-66.64)	(-64.38)
Relative labour productivity in log	-0.250	...
	(-40.63)	...
Relative multifactor productivity in log	...	-0.245
	...	(-36.03)
Binary variables for entry cohort		
1986	...	...
	...	...
1987	-0.017	-0.016
	(-0.76)	(-0.76)
1988	-0.019	-0.019
	(-0.84)	(-0.85)
1989	-0.048	-0.049
	(-2.11)	(-2.16)
1990	0.095	0.095
	(4.29)	(4.27)
1991	0.116	0.115
	(5.17)	(5.15)
1992	0.119	0.117
	(5.01)	(4.94)
1993	0.165	0.165
	(6.93)	(6.92)
1994	0.122	0.121
	(4.85)	(4.79)
1995	-0.263	-0.263
	(-9.33)	(-9.33)
1996	-0.367	-0.367
	(-11.33)	(-11.33)
Observations	71,278	71,278
Log likelihood	-352,539	-352,731

... not applicable

Notes: Estimation uses the Cox partial likelihood proportional hazards model. The numbers in parentheses are robust t statistics. All regressions control for fixed effects for 3-digit Standard Industrial Classification industries.

Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

Chart 7
Baseline hazard of new firms in the retail trade sector



Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

5.2 Post-entry performance

To examine post-entry performance of new retail stores in Canada, we estimate a regression equation that relates firm performance to binary variables for the age of the entrants, cohort binary variables and industry binary variables:

$$\ln Y_{it} = \alpha_1 + \alpha_2 age_{it} + \alpha_3 Industry_i + \alpha_4 Cohort_t + \varepsilon_{it}, \qquad (8)$$

where Y_{it} represents various measures of the performance of firm i in period t—ranging from labour productivity, multifactor productivity, output, capital, and labour. We estimate this specification on all cohorts of new firms born from 1986 to 1996 that survived until 1998. The binary variables for industry control for the difference in average firm performance across 3-digit retail trade industries. The binary variables for year cohorts allow for the difference in firm performance between cohorts that arises from differences in the macro environment at birth. We estimate Equation (8) using both unweighted Ordinary Least Squares (OLS) and weighted-least squares (WLS) regression techniques. The results from OLS represent the post-entry performance of an average entering firm, while the results from WLS can be interpreted as the performance of all entrants as a cohort group.

Regression results for labour productivity growth and multifactor productivity growth of new firms in the Canadian retailing sector are presented in Table 13. The results in the first two columns are obtained using the OLS regression. In Chart 8, we use these results to plot the productivity of an average entrant over its life. We find that the average entrant has negative

labour productivity growth. It also has negative multifactor productivity growth. Labour productivity of entrants declined at a rate of 1.6% per year during a 13-year period following entry. Multifactor productivity showed a similar decline. The decline in labour productivity and multifactor productivity is rapid during the first three years after birth. Labour productivity declined by 3.1% per year during the first three years, while multifactor productivity declined by 2.4% per year.

Table 13
Post-entry growth in productivity of new firms in the Canadian retailing sector

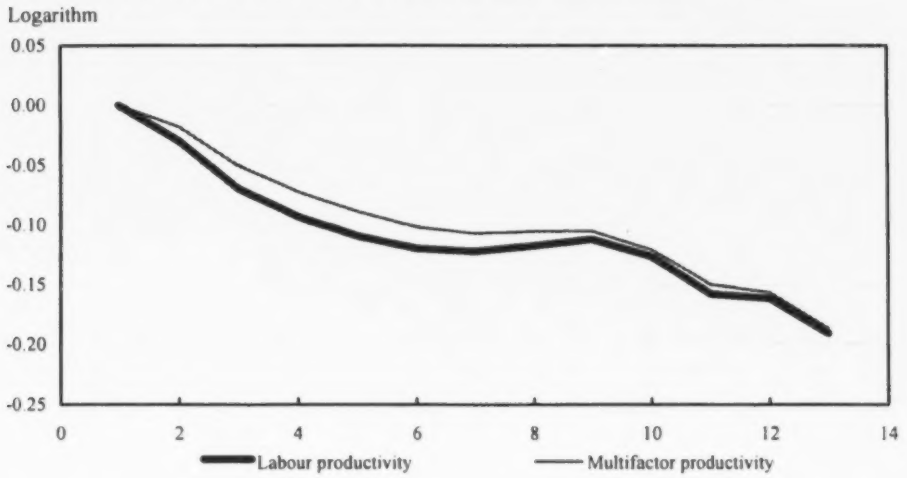
Variable	Unweighted regression		Weighted regression	
	Labour productivity	Multifactor productivity	Labour productivity	Multifactor productivity
Binary variables for the age of new firms (number of years)				
1	...	...	...	...
	...	...	...	...
2	-0.030	-0.018	0.049	-0.010
	(-5.14)	(-3.54)	(1.15)	(-0.15)
3	-0.070	-0.051	0.035	-0.014
	(-11.91)	(-9.92)	(0.87)	(-0.22)
4	-0.093	-0.072	0.029	-0.032
	(-15.38)	(-13.65)	(0.70)	(-0.47)
5	-0.109	-0.089	0.020	-0.030
	(-17.23)	(-16.00)	(0.50)	(-0.68)
6	-0.119	-0.102	0.050	-0.014
	(-18.03)	(-17.59)	(1.27)	(-0.29)
7	-0.122	-0.107	0.072	0.014
	(-17.56)	(-17.59)	(1.54)	(0.26)
8	-0.117	-0.106	0.104	0.081
	(-16.05)	(-16.48)	(2.00)	(0.96)
9	-0.112	-0.105	0.141	0.107
	(-14.53)	(-15.39)	(2.32)	(1.13)
10	-0.126	-0.121	0.164	0.105
	(-15.02)	(-16.21)	(2.29)	(1.18)
11	-0.158	-0.150	0.154	0.101
	(-16.20)	(-17.28)	(1.80)	(1.07)
12	-0.161	-0.156	0.077	0.014
	(-13.82)	(-15.07)	(0.72)	(0.13)
13	-0.191	-0.186	0.121	0.063
	(-12.15)	(-13.29)	(2.63)	(1.23)
Observations	277,199	277,199	277,199	277,199
R squared	0.16	0.15	0.32	0.40

... not applicable

Notes: The numbers in parentheses are robust t statistics. All regressions control for fixed effects for 3-digit Standard Industrial Classification industries and entry cohort. The weighted regression for labour productivity uses average labour units as weights, and the weighted regression for multifactor productivity uses sales as weights.

Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

Chart 8
Post-entry productivity of new firms in the retail trade sector



Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

The results using WLS regression, shown in the last two columns, allow us to track the post-entry performance of entrants as a group.[21] We find that entrants as a group improve labour productivity after entry. But the improvement occurs only seven years after birth. During the first seven years, entrants experience little change in labour productivity growth.

The improvement in labour productivity for entrants is due to increases in capital-labour intensity. Multifactor productivity for the entrants showed no significant changes during a 13-year period after birth.

The difference between the OLS and WLS regression results indicates that large and smaller entrants have different post-entry performance: large entrants improve labour productivity and become more capital intensive over time; small entrants do not.

In Tables 14 and 15, we examine post-entry growth in output, capital stock and labour among new firms in the retail trade sector. The results from unweighted regressions, shown in Table 14 and plotted in Chart 9, show that output, capital and labour of an average entering firm increase during the first nine years of its life. The growth reaches its peak in the ninth year for surviving entrants. After the ninth year, output starts to decline, while capital and labour show little change.

21. The regression for labour productivity use employment as weights. The regression for multifactor productivity uses output as weights.

Table 14
Post-entry growth in output, capital and labour of new firm in the Canadian retail sector

Variable	Output	Capital	Labour
Binary variables for the age of new firms (number of years)			
1	...	...	...
	...	...	...
2	0.082	0.052	0.112
	(10.31)	(6.35)	(14.93)
3	0.106	0.080	0.175
	(13.03)	(9.59)	(23.12)
4	0.127	0.116	0.221
	(14.87)	(13.25)	(27.58)
5	0.146	0.153	0.255
	(16.06)	(16.47)	(30.12)
6	0.153	0.186	0.273
	(15.91)	(18.82)	(30.45)
7	0.170	0.218	0.292
	(16.60)	(20.84)	(30.82)
8	0.186	0.245	0.303
	(16.99)	(21.93)	(29.85)
9	0.198	0.276	0.310
	(16.68)	(22.67)	(28.28)
10	0.186	0.285	0.312
	(14.01)	(21.09)	(25.63)
11	0.171	0.288	0.329
	(10.99)	(18.26)	(23.45)
12	0.166	0.304	0.327
	(8.73)	(15.66)	(18.90)
13	0.123	0.292	0.313
	(4.62)	(10.73)	(12.92)
Observations	277,199	277,199	277,199
R squared	0.20	0.14	0.10

... not applicable

Notes: The results are from unweighted regressions. The numbers in parentheses are robust t statistics. All regressions control for fixed effects for 3-digit Standard Industrial Classification industries and fixed effects for entry cohorts.

Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

Table 15
Post-entry growth in output, capital and labour of new firm in the Canadian retail sector

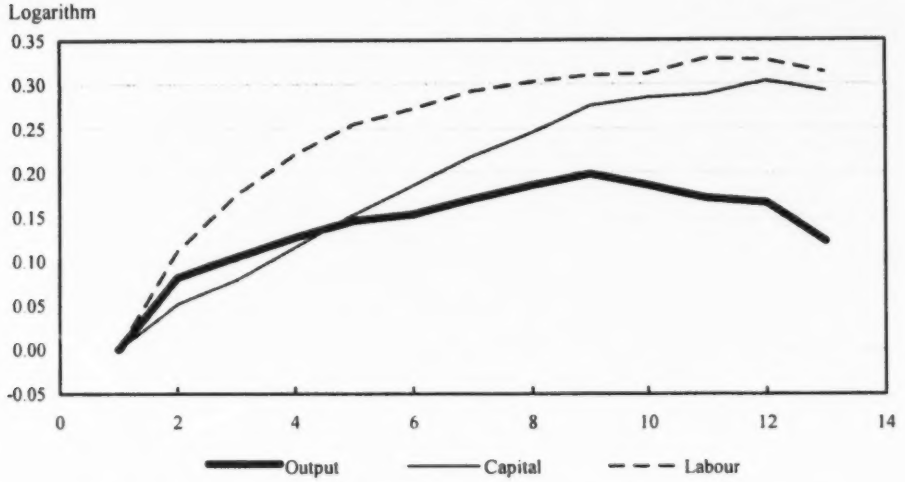
Variable	Output	Capital	Labour
Binary variables for the age of new firms (number of years)			
1	...	...	...
	...	...	...
2	0.090	0.096	0.040
	(0.69)	(0.49)	(0.19)
3	0.179	0.182	0.099
	(1.30)	(0.89)	(0.46)
4	0.259	0.281	0.199
	(1.69)	(1.21)	(0.84)
5	0.314	0.320	0.255
	(2.02)	(1.52)	(1.36)
6	0.379	0.373	0.271
	(3.56)	(2.46)	(1.64)
7	0.528	0.593	0.349
	(4.08)	(3.27)	(2.03)
8	0.636	0.551	0.404
	(4.34)	(3.46)	(2.28)
9	0.768	0.654	0.487
	(4.54)	(3.95)	(2.69)
10	0.876	0.765	0.555
	(4.50)	(4.29)	(2.90)
11	0.945	0.735	0.640
	(4.45)	(4.02)	(2.99)
12	0.931	0.818	0.764
	(3.86)	(4.03)	(3.09)
13	0.807	0.865	0.521
	(4.98)	(4.80)	(2.69)
Observations	277,199	277,199	277,199
R squared	0.66	0.57	0.48

... not applicable

Notes: The results are from weighted regressions. The numbers in parentheses are robust t statistics. All regressions control for fixed effects for 3-digit Standard Industrial Classification industries and fixed effects for entry cohorts.

Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File.

Chart 9
Post-entry output, capital and labour of new firms in the retail trade sector



Sources: Statistics Canada, Longitudinal Employment Analysis Program; Canada Revenue Agency, Corporate Tax Statistical Universal File

When output reaches its peak in the ninth year after birth for an average retail store, the output is about 22% higher than its output at birth. This suggests that the average surviving new firm in the retail trade sector would not catch up to the average size of incumbent firms. Average output of entering firms at birth is 67% lower than that of incumbents.

The results from weighted regression, shown in Table 15, allow us to track the post-entry growth in output, capital and labour among surviving entering cohort as a group.[22] The growth in output, capital and labour for the surviving cohort as a group is two to four times higher than the growth of an average entering firm. Thus, large entrants tend to have higher growth in output, capital and labour than do smaller entrants. The growth of the surviving cohort continues after the ninth year. Unlike the average entrant that would not catch up to the size of incumbents, the entering cohort would reach the size of incumbents in the ninth year. The output of the entering cohort that survived until the ninth year is about 2.2 times as large as the output at birth, which is slightly bigger than the output difference between the entrants at birth with incumbents.

In sum, we find that entrants undergo both selection and learning after birth. Of an entering cohort, the least productive firms exit and the more productive ones survive. The surviving firms of the entering cohort exhibit declining failure rates and improve performance as they learn about best business practices.

To assess the relative importance of selection and learning in the post-entry performance, we examine the change in labour productivity that a cohort of all entrants that entered in 1985

22. The regressions for log output, capital and labour use output, capital and labour as weights, the regression for log labour uses labour as weights, and the regression for log capital uses capital as weights.

experienced over the subsequent period from 1985 to 1998. The change in labour productivity of the cohort of entrants over the period from 1985 to 1998 is the difference between the labour productivity of the cohort in 1985 and the labour productivity of the surviving cohort in 1998:

$$\sum_{i \in S} s_i^{1998} p_i^{1998} - \sum_{i \in N} s_i^{1985} p_i^{1985} . \tag{9}$$

Where s_i is the employment share of plant i in the cohort of entrants in a year, p_i is the productivity of plant i, N denotes a set of all entrants that entered in 1985, and S denotes a set of entrants that survived during the period from 1985 to 1998. The change in labour productivity of the cohort of entrants can be decomposed into the effect of learning and the effect of selection:

$$\sum_{i \in S} s_i^{1985} (p_i^{1998} - p_i^{1985}) + \left[\sum_{i \in S} (s_i^{1998} - s_i^{1985}) p_i^{1998} - \sum_{i \in X} s_i^{1985} p_i^{1985} \right]. \tag{10}$$

The first term represents the effect of learning on the post-entry performance of an entrant cohort, while the second term captures the effect of selection. The effect of learning is positive if surviving entrants improve productivity performance. The effect of selection is positive if the less productive plants exit and more productive plants survive.

Using the data for the retail trade sector from the T2-LEAP file, we find that the labour productivity of the 1985 entrant cohort increased by 61% over the period from 1985 to 1998, of which 7 percentage points are due to the effect of learning and the remaining 53 percentage points are due to the effect of selection.[23] We conclude that both selection and learning affect post-entry performance, but selection is much more important for the overall growth of a cohort.

6 Conclusion

This paper contributes to the recent and growing literature that examines the dynamics of productivity growth in the service sector by focusing on the retail trade sector in Canada. In contrast to most previous studies on firm turnover and productivity growth, which focused on manufacturing sector, this paper has examined the dynamics of productivity growth in the retail trade sector in Canada. The evidence indicates that most of the productivity growth in the Canadian retail trade sector can be attributed to firm turnover and the competitive process that shifts output and input from exiting firms and contracting incumbents to more productive entering firms and more productive growing incumbents. Our main findings can be summarized as follows.

23. We have also decomposed the change in total factor productivity of the entrant cohort into the effect of learning and the effect of selection. The results are similar. Selection is more important for the overall growth of a cohort. Over the period 1985 to 1998, there is slight decline in total factor productivity of a cohort that entered in 1985. The decline reflects the decline in total factor productivity of the surviving entrants in the period. The effect of selection is small but positive.

First, the Canadian retail trade sector has a high firm turnover. About 60% of firms that were present in 1984 were no longer in operation in 1998. The exiting firms accounted for 25% of total sales and 30% of total employment of the retail trade sector. About 70% of the firms that were in operation in 1998 were new firms that had entered the retail trade sector during the 1984-to-1998 period, accounting for 42% of total sales and 41% of total employment.

Second, entering firms are much more productive than exiting firms. On average, the firms that entered the retailing sector in the 1986-to-1998 period had labour and multifactor productivity that was 20% higher than the firms that exited in the period. We find that entrants at birth had similar labour and multifactor productivity in comparison with incumbents. The exiting firms had lower labour and multifactor productivity than incumbents.

Third, the growth in labour and multifactor productivity in the Canadian retail trade sector is accounted for by firm turnover and restructuring in the retail trade sector over the period from 1984 to 1998. The results for the Canadian retail trade sector stand in sharp contrast to the results for the Canadian manufacturing sector, where entry and exit and firm turnover account for about 50% of labour productivity growth in a 10-year period.

Fourth, foreign-controlled firms contributed 5.7 percentage points or 30% of labour productivity growth in the retail trade sector for the period from 1984 to 1998. They contributed 4.7 percentage points or 45% of multifactor productivity growth in the retail trade sector. The contribution of foreign-controlled firms to productivity growth is disproportionately larger than their contribution to sales, which was about 20% over the period.

Fifth, entrants undergo both selection and learning after birth. Of an entering cohort, the least productive firms exit and the more productive ones survive. The surviving firms of the entering cohort exhibit declining failure rates and improve performance as they learn about best business practices. We find that one quarter of the entrants exit during the first three years after birth, and about one half of the entrants survive until the eighth year. The average sized surviving firm of an entering cohort reaches the average size of incumbents in the ninth cohort year. Successful entrants have rapid output growth after the fifth year and have rapid labour productivity growth after the seventh year. During earlier years of their life, entrants show little significant change in output and labour productivity.

Sixth, learning takes place among large entrants. For small entrants, we find that labour productivity growth and multifactor productivity growth are negative after birth. The growth in output, capital and labour is also lower among small firms than among large firms. The average entrant would reach a peak in output in about its ninth year and would not catch up to the size of incumbents.

Our evidence on the importance of firm turnover and the competitive process in productivity growth in the retail trade sector complement the previous studies that show that much of productivity growth in the retail trade sector in Canada is linked to the use of information and communications technologies (ICTs) and organizational innovation. The evidence in this paper suggests that this ICT-led productivity growth comes from more productive entering firms and existing firms that use ICTs and adopt innovative organizational practices, gaining market share from the exiting firms and less productive existing firms. The evidence in this paper also

suggests that the much-discussed Wal-Mart effect on the retail sector productivity mainly comes from the Wal-Mart-created competitive pressure and restructuring that shifts market share from exitors and declining incumbents that lost market share to entrants and growing incumbents.

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